

WHAT IS CLAIMED IS:

1. An optical interconnection device comprising
an optical waveguide layer, wherein the waveguide
layer is equipped with a plurality of electrodes
5 which are independently drive-controllable such that
a refractive index distribution is generated in the
waveguide layer by drive control of the electrodes to
control a propagation state of light in the waveguide
layer, and an optical interconnection port is
10 provided on an upper or lower surface or inside of
the waveguide layer.

2. The optical interconnection device according
to claim 1, wherein the optical interconnection port
15 is comprised of an optical element for receiving or
emitting a light in a direction approximately
perpendicular to a light-waveguiding surface and an
optical path conversion means provided corresponding
to the optical element at a given position in the
20 waveguide layer.

3. The optical interconnection device according
to claim 2, wherein the optical path conversion means
is a light reflector with a convex shape, and the
25 optical element is a plurality of surface elements
arranged around a top of the convex of the light
reflector with their centers deviated from the top of

the convex such that each optical element effects emission or reception only to and from a limited region within the waveguide layer.

5 4. The optical interconnection device according to claim 2, wherein the optical element is a surface element comprised of a semiconductor crystal and has such a constitution that only a thin film layer necessary for receiving or emitting light of the
10 semiconductor crystal is transferred to the waveguide layer and a semiconductor substrate is omitted.

 5. The optical interconnection device according to claim 1, wherein the drive-controllable electrodes
15 are divided in plurality and provided on one side or both sides of the waveguide layer.

 6. The optical interconnection device according to claim 5, wherein the drive-controllable electrodes
20 are a plurality of heaters provided on a surface of the waveguide layer and a refractive index distribution is generated in the waveguide layer by temperature control with the electrodes.

25 7. The optical interconnection device according to claim 5, wherein the drive-controllable electrodes are provided in plurality on a surface of the.

waveguide layer so as to enable local electric-field application and a refractive index distribution is generated in the waveguide layer by electric-field control with the electrodes.

5

8. A photoelectric mixedly mounted device comprising integrally the optical interconnection device set forth in claim 1, an electronic device connected to an optical interconnection port provided
10 in the optical interconnection device and an electric wiring layer.

9. The photoelectric mixedly mounted device according to claim 8, having a package form equipped
15 with a connection terminal for electric connection with the outside.

10. The photoelectric mixedly mounted device according to claim 8, having a connection port for
20 optical interconnection to the outside.

11. The photoelectric mixedly mounted device according to claim 8, having such a configuration that a pattern of a manner of optical interconnection
25 of the photoelectric mixedly mounted device is stored in a memory inside or outside of device, and the pattern is read from the memory in accordance with an

instruction to change the optical interconnection to switch an operation of the device.

12. The photoelectric mixedly mounted device
5 according to claim 8, having such a configuration
that a pattern of a manner of optical interconnection
of the photoelectric mixedly mounted device is
downloaded as a design asset from outside of the
device and rewritten, and an operation of the device
10 is switched on the downloading.

13. An electronic equipment comprising the
photoelectric mixedly mounted device set forth in any
one of claims 8 to 12 to have such a configuration
15 that connections between IC chips is freely
reconfigured and a plurality of built-in systems are
switched by one equipment.